Instructional Targets

Standards for Scientific Inquiry

- Identify questions that can be asked about the natural environment.
- Conduct simple scientific investigations.
- Use tools to gather data and information.
- Analyze and interpret data.
- Communicate procedures and explanations about an investigation.

Differentiated Tasks

Level 3 Students will...	Level 2 Students will...	Level 1 Students will...
• Follow steps of a scientific process related to grades 6-8 science topics.	• With support, follow steps of a scientific process related to grades 6-8 science topics.	• Actively participate in a scientific process related to grades 6-8 science topics.

Topic Connection

Throughout this unit, students explore how light and sound waves interact with various materials. In this lesson, students will investigate materials that transmit, reflect and absorb light waves.

Topic Words

absorb
light*
light wave
reflect

Science Words

ask*
conclusion
data
experiment
guess
hypothesis
observe
process
question*
scientific

* Power Words

Lesson at a Glance

	Activity 1	Activity 2	Activity 3	Activity 4
Instructional Activities	Introduce the Experiment	Make a Guess / Hypothesis	Conduct the Experiment	Review and Share Findings
See how these activities fit into the **Suggested Monthly Plan**.				
ULS Materials and Resources	**Picture/Word Cards** flashlight light light wave see opaque transparent translucent transmit reflect absorb	**Experiment Steps 1 and 2**	**Experiment Steps 3 and 4** **Picture/Word Cards** blank wall flashlight pillow mirror glass bowl Light Waves on the Move	**Experiment Steps 4 and 5**
	Instructional Tools: Scientific Inquiry Processes			
Additional Materials	**Real Objects** blank wall tissue paper eyeglasses flashlight various classroom materials		**Experiment Materials** blank wall flashlight pillow mirror glass bowl	

Instructional Targets

Standards for Scientific Inquiry

- Identify questions that can be asked about the natural environment.
- Communicate procedures and explanations about an investigation.

Instructional Routine

Introduce	• Introduce the activity by asking a focus question. For example, display a flashlight and ask, "What is a flashlight—a tool that makes sound or a tool that makes light?" Discuss students' responses. • Discuss how flashlights provide us with light. Explain how the light from the flashlight moves in waves. Light waves can move through some objects. Light waves cannot move through other objects. Objects that allow all light to move through them are called transparent. Objects that allow some light to move through them are translucent. Objects that do not allow light to move them are called opaque. • Tell students they are going to observe what happens when light hits different objects. For example, say, "Today, you are going to use a flashlight to observe what happens when light hits different objects. • Review the learning goal with students: **I will use a flashlight to observe and ask questions about what happens when light hits different objects.**
Model	• Model holding the flashlight and pointing it at your hand in front of a blank wall. Turn on the light and comment about what happens when the light hits your hand, such as, "The light hits my hand. I do not see that the light moved through my hand and onto the wall behind me. The light seems to stop at my hand. My hand is opaque. It does not let light move through it." Continue modeling with a piece of tissue paper (translucent) and eyeglasses (transparent). Picture/Word Cards have been included in the lesson to aid in vocabulary development and communication. • Model asking questions about what will happen when light hits other objects in the classroom, such as pencils, staplers, coats, notebook paper, etc. For example, ask, "What will happen when I shine the flashlight on my desk?" Model shining the light on other objects in the classroom and describing what happens.
Provide Practice	***Provide students with a flashlight and various classroom objects. Aid the students in manipulation of the flashlight and classroom objects as needed.*** **Level 3:** Have the student use a flashlight and classroom objects to observe and ask questions about what happens when light hits different objects. Encourage the student to ask questions and share observations with his or her peers. **Level 2:** Have the student use a flashlight and classroom objects to observe and ask questions about what happens when light hits different objects. Encourage the student to ask questions and share observations, using visual support as needed. **Level 1:** With support, guide the student to use a flashlight and classroom objects to observe and ask questions about what happens when light hits different objects. For example, shine the light on the eyeglasses. Have the student use their active participation mode to select the word "transparent" to describe the object when light hits it (may be single option or errorless choice).
Review	• Revisit the learning goal. For example, ask, "What materials did the light move through? What materials did some light move through?" or "What materials did the light not move through?" • Tell students that when light moves through objects, it is called transmission. When light does not move through objects, it can either reflect (bounce off of) or be absorbed (soaked up) by the object. Use the Picture/Word Cards included with the lesson to help students visualize these terms. • Tell students that, next, they will begin an experiment to find out what kinds of materials transmit, reflect and absorb light.

Check Understanding

Level 3: Can the student make and share an observations?

Level 2: Can the student make an observation?
Can the student share observations?

Level 1: Can the student participation in making a supported observation? How?
Can the student communicate about a supported observation? How?

Instructional Targets

Standards for Scientific Inquiry

- Identify questions that can be asked about the natural environment.
- Communicate procedures and explanations about an investigation.

Instructional Routine

Introduce	• Introduce the activity with a focus question such as, "What is light—a type of energy that lets us see or a type of energy that lets us hear?" Remind students that light is a type of energy that lets us see. • Continue discussion by reading the "What We Know" statements in the Experiment. Compare or have students compare these statements to what they learned about light in Activity 1. • Tell students that they will now begin an experiment about what happens when light hits different objects. For example, say, "When we do an experiment, we ask a question and make a guess or hypothesis. Today, it is your job to ask a question and make a guess/hypothesis." • Review the learning goal with students: **I will ask a question and make a guess/hypothesis.**
Model	• Display Science Experiment Steps 1 and 2. • Read Step 1. Emphasize that right now you can only make a guess or hypothesis about the answers to these questions. Point out that the final answers will come from doing the experiment. • Read Step 2 and model making a guess/hypothesis. For example, say, "I saw light from the flashlight go through the lens in a pair of eyeglasses. The glass bowl is made of glass too. I think the light will be transmitted or move through the bowl instead of being reflected or absorbed." • Continue modeling to show the students how to record your guess/hypothesis.
Provide Practice	**Level 3:** Have the student make a guess/hypothesis by writing or dictating what they think will happen. **Level 2:** Have the student make a guess/hypothesis using visual supports as necessary. **Level 1:** Have the student make a guess/hypothesis by choosing from 2 to 3 choices (may be errorless).
Review	• Revisit the learning goal. Point out that today, students completed the first two steps of the scientific process—they asked a question and made a guess/hypothesis. • Tell students that next, they will conduct the experiment and gather data.

Check Understanding

- **Level 3:** Can the student make a guess/hypothesis by writing or dictating?
- **Level 2:** Can the student make a guess/hypothesis with visual support?
- **Level 1:** Can the student make a guess/hypothesis from 2 to 3 choices (may be errorless)?

Instructional Targets

Standards for Scientific Inquiry

- Conduct simple scientific investigations.
- Use tools to gather data and information.

Instructional Routine

Introduce	• Introduce the activity by displaying a flashlight and asking a focus question such as, "What happens when the light comes out of the flashlight—the light moves in waves or the light sounds loud?" Discuss students' responses. • Review the guesses/hypotheses students made in Activity 2. Then introduce the materials needed for the Experiment. Picture/Word Cards are provided to support vocabulary development. • Tell students they will now complete Steps 3 and 4 of the scientific process. For example, say, "Today, your job is to do an experiment and gather and record data." • Review the learning goals with students: **I will do an experiment.** **I will gather and record data.**
Model	• Display the experiment page. Model reading and following the directions in Step 3 to complete the experiment. • When you come to Step 4 in the directions, model how to gather and record data. For example, say, "When the light hit the pillow, it seemed to stop. Light did not move through it. I could not see it on the wall. It did not bounce off of the object. I will place a check in the last column 'Light does not bounce off of or move through the material'."
Provide Practice	**Level 3:** Have the student follow the directions to conduct the experiment and gather and record data. **Level 2:** With support, have the student follow the directions to conduct the experiment and gather and record data. **Level 1:** Have the student use his or her active response participation mode to participate in conducting the experiment and gathering and recording data.
Review	• Revisit the learning goals by discussing the steps to the experiment, as well as what happened during the experiment. • Point out that today, students completed steps 3 and 4 of the scientific process—they conducted an experiment and they gathered data. Explain that the next step is to review and discuss the data they gathered and find the conclusion.

Check Understanding

Level 3: Can the student independently follow steps to complete an experiment?
Can the student independently gather and record data?

Level 2: Can the student follow steps to complete an experiment with support?
Can the student gather and record data with support?

Level 1: Can the student actively participate in an experiment? How?
Can the student actively participate in gathering and recording data? How?

Instructional Targets

Standards for Scientific Inquiry

- Analyze and interpret data.
- Communicate procedures and explanations about an investigation.

Instructional Routine

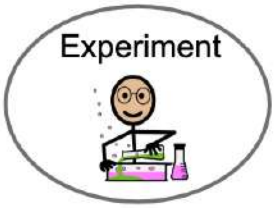
Introduce	• Introduce the activity by asking a focus question such as, "What can happen when light does not move through an object—it is reflected, it is absorbed, or both?" Discuss students' responses. • Prompt students to recall the experiment. For example, say, "We did an experiment about what happens when light hits different objects. We gathered and recorded data. Today, it is your job to look at the data and decide if the guess/hypothesis you made in Step 2 was correct." • Review the learning goal with students: **I will decide if my guess is correct.**
Model	• Display a completed data form from Step 4. • Model using the data to answer the questions in Step 5. • Discuss why the guess/hypothesis you made in Step 2 is correct or incorrect.
Provide Practice	**Level 3:** Have the student use data from Step 4 to answer the questions in Step 5 independently. **Level 2:** Have the student use data from Step 4 to answer the questions in Step 5. Provide support as necessary. **Level 1:** Review the data from Step 4 with the student. Then have the student answer each question in Step 5 by selecting an answer from a single option or errorless choice.
Review	• Revisit the learning goal. For example, discuss what happened in the experiment and have students share their findings. Use the additional information at the end of the experiment to discuss student learning. • Explain that students have now completed all five of the steps in the scientific process. Review the steps.
Extension	• Have the students repeat the experiment with other types of materials (e.g., materials that are transparent, translucent and opaque) and compare the results.

Check Understanding

- **Level 3:** Can the student use data to independently decide if a guess/hypothesis was correct?
- **Level 2:** With support, can the student use data to decide if a guess/hypothesis was correct?
- **Level 1:** Can the student make a selection from a single option or errorless choice to indicate if a guess/hypothesis was correct?

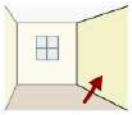
NEED

experiment



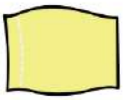
Light Waves on the Move

blank wall



flashlight

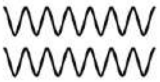
pillow



mirror

glass bowl

What We Know:



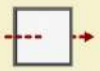
- Light travels in waves.
- Light waves can be transmitted (move through) some materials.
- Light waves that do not move through materials can be reflected (bounce off of) or absorbed (soaked up).

Step 1: Ask a Question

- What material will transmit light?
- What material will reflect light?
- What material will absorb light?

Step 2: Make a Guess / Hypothesis

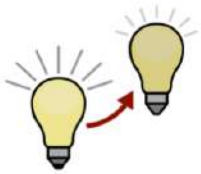
I think...

	 light will be transmitted by a...	 light will reflect off of a...	 light will be absorbed by a...
pillow			
mirror			
glass bowl			

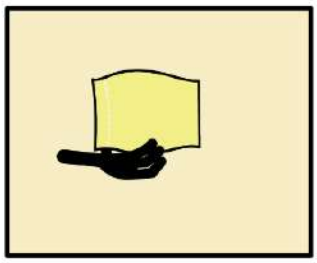
See Experiment Steps 1-2

Step 3: Do an Experiment

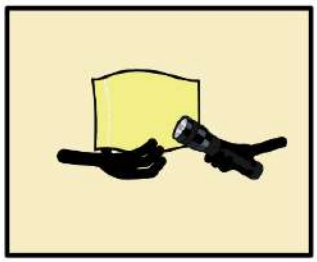
1. Dim the light in the classroom.



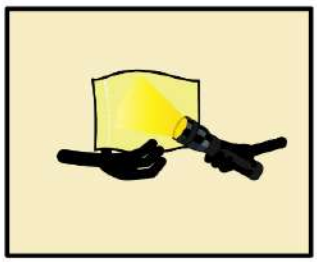
2. Hold the pillow a few inches in front of the wall.



3. Hold the flashlight a few inches in front of the pillow.



4. Shine the flashlight at the pillow.

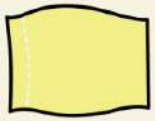


Step 3: Do an Experiment

5. Record results on chart.

6. Repeat steps 2-5 with mirror and glass bowl.

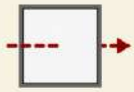
Step 4: Organize Data

Material 	Light moves through material 	Light bounces off of material 	Light does not bounce off of or move through material 
pillow 			
mirror 			
glass bowl 			

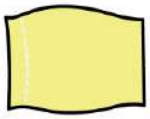
See Experiment Steps 1-4

Step 5: Find the Conclusion

Which materials transmitted the light?



pillow

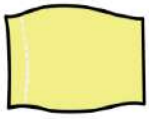


mirror

glass bowl

Which materials reflected the light?

pillow

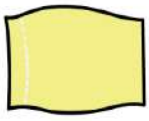


mirror

glass bowl

Which materials absorbed the light?

pillow



mirror

glass bowl

Was your guess correct?

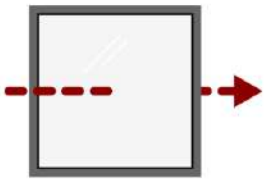
yes

no

Step 5: Find the Conclusion

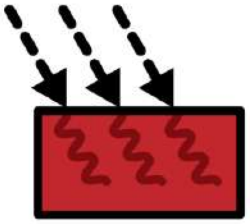
Explanation:

- Light moves in waves. These waves can move through some materials. This is called transmission. Materials that are transparent allow all light to move through them. Materials that are translucent allow some of the light to pass through them. A glass bowl is transparent. You can see through it. When you shined the flashlight on it, the light moved through the glass bowl. You saw the light on the wall behind the bowl. The glass bowl transmitted the light waves.



- Light waves do not move through some materials. Materials that are opaque do not allow light to pass through them. The materials might reflect the light waves. This happens when the light waves bounce off of the material. Shiny and smooth opaque materials often reflect light waves. The mirror is opaque and shiny. When you shined the flashlight on the mirror, the light did not move through the mirror. You did not see the light on the wall behind the mirror. The light bounced off of the mirror. It may have shined on another part of the wall or floor. The mirror reflected the light waves.

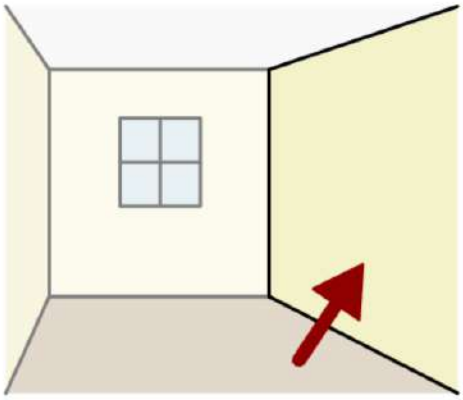
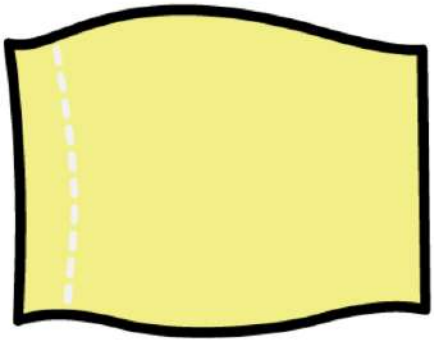
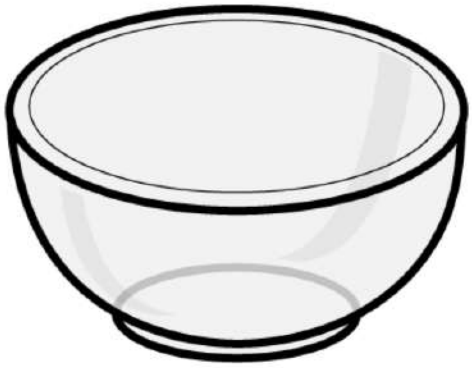
- Some opaque materials absorb or soak up light waves. Soft objects often absorb light waves. A pillow is a soft object. When you shined the flashlight on the pillow, the light did not move through the pillow. You did not see the light on the wall behind the pillow. You did not see the light bounce off of the pillow. The light seemed to disappear. The pillow absorbed the light waves.



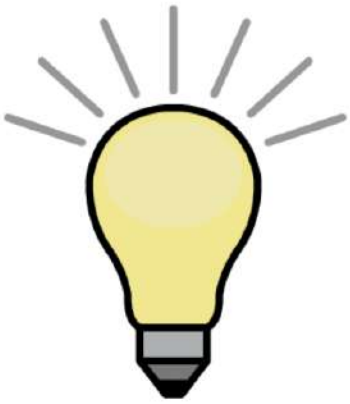
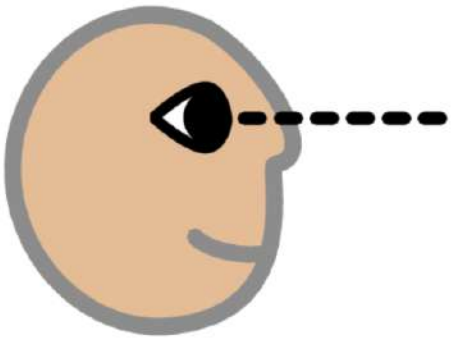
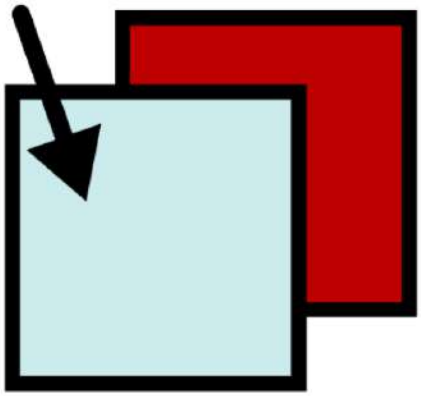
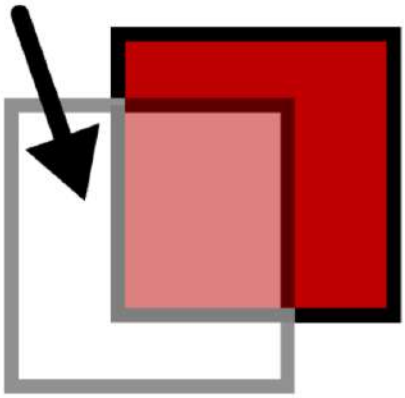
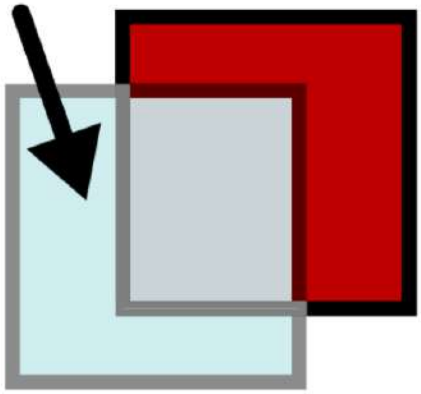
Extension:

- Have students repeat the experiment with other types of materials in the classroom.

For hands-on instruction, print, cut out and laminate.

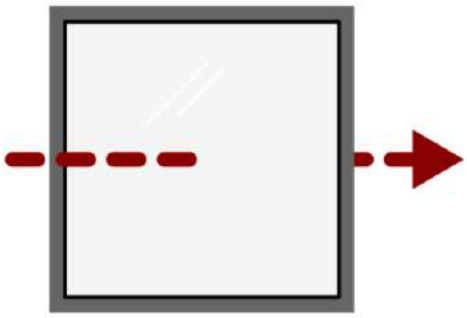
blank wall 	flashlight 
pillow 	mirror 
glass bowl 	Light Waves on the Move 

For hands-on instruction, print, cut out and laminate.

light 	light wave 
see 	opaque 
transparent 	translucent 

For hands-on instruction, print, cut out and laminate.

transmit



reflect

absorb